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and headquarters have been established at Cheyenne, Wyoming. It is hoped that some work may be done during the present season in most of the States and Territories west of the Mississippi River in which irrigation is practiced to any considerable extent. Arrangements have also been made to aid the New Jersey experiment stations in continuing their investigations, which have already attracted much favorable attention in the East.

As far as practicable the cooperation of the experiment stations will be sought in these investigations, and it is to be hoped that one result of this work will be that the stations will not only be able to develop their investigations relating to irrigation in the lines in which the Department will work under this appropriation, but also in other important lines involving operations by different divisions of the station. It is believed that, by concentrating their efforts on problems based on the requirements of agriculture under irrigation, the stations in a number of States and Territories may materially enhance their usefulness.

It should be clearly understood that the irrigation investigations of this Department are intended to cover only a limited portion of the field of investigations relating to agriculture under irrigation which the stations and the different divisions of the Department may properly undertake. An effort will be made to mark out a line of work for these investigations which will give them a distinct place between the investigations of the Geological Survey relating to the topography and water supply of the irrigated region, and those of the different branches of the Department and stations which relate to the climate and plants of that region. Aside from the studies of the laws and institutions of communities in which irrigation is practiced, the irrigation investigations will have for their chief ob-

ject the determination of the economic and profitable utilization of water in agriculture as it is supplied to the farmer through reservoirs, canals and ditches. In these investigations, as in nearly all others relating to the complex science of agriculture, there will be many points of contact with investigations conducted under other auspices, and thus many opportunities for co-operative effort will be presented. With so large a field of operations and so great interests at stake, there will be abundant room for all the agencies now at work for the benefit of agriculture of the irrigated region to fully utilize all the means at their command. Besides the development of the irrigation investigations, the Department will, for example, continue studies of alkali soils, the native and cultivated plants and trees best adapted to the arid regions, and other related questions.

The people of that vast area of our country in which agriculture and the other industries are so largely dependent on the successful practice of irrigation are to be congratulated that attention was more earnestly and successfully drawn to their needs during the recent session of Congress than ever before, and more ample provision than heretofore was made for studying the problems of agriculture in that region, through increased appropriations for the work of the Geological Survey and different branches of the Department of Agriculture.

A. C. TRUE,
Director.

THE INTERNATIONAL CATALOGUE OF SCIENTIFIC LITERATURE.—SECOND CONFERENCE.

II.

It becoming apparent that no early conclusion would be reached, based on the resolution of Professor Armstrong, it was withdrawn, and Dr. Adler moved "That the registration symbols used in the Cata-

logue be based on a system of letters and numbers, adapted in the case of each branch of science to its individual needs." Professor Darboux proposed the expression 'of letters or of numbers.' Dr. Adler explained his motion by saying that the use of letters and numbers which would furnish the opportunity of alternating gave a greater elasticity to the system than the use of either one by itself.

Chevalier Descamps objected to the terms of the resolution as restricting the Catalogue to the use of letters and numbers as symbols, whereas it might be found desirable to employ other symbols. Professor Armstrong thought that this construction need not be placed on the words, the idea being that letters and numbers were the fundamental symbols.

Professor Darboux said that the real matter to arrive at was a scheme of classification suited to present needs, and of whose durability one might be assured. After some further discussion Dr. Adler made a further explanation as to the object of his resolution. The first Conference had discussed the subject of classification and symbols, and not being able to arrive at any conclusion had referred the matter to the Royal Society. The Society had appointed a committee, which, after long labor, had presented a report, and thus far the Conference had done nothing but criticise it. He did not think it desirable or possible to discuss further detail. The resolution moved was broad and in general terms with the idea that its interpretation and details be left to the persons in whose charge the execution of the Catalogue would actually be. In order, however, to get further advice on the subject he would later on move a provision for an international committee and give the scientific men of the various countries an opportunity to pass on the details of classification.

Professor Klein (Germany) strongly ap-

proved the appointment of an international committee and of special committees in the various countries, and supported the resolution with a suggestion as to verbal modification.

Dr. Heller spoke in recognition of the work of the Royal Society and supported the statement of Professor Klein and others, that the various sciences had different needs. After remarks by Dr. Graf the resolution was slightly amended by inserting the words 'or other symbols' in addition to letters and numbers.

M. Otlet asserted that the lack of uniformity in the system proposed would result in great inconvenience. Professor Darboux thought the whole matter not of great importance and going too much into detail. Professor Armstrong, however, stated that such a resolution was very much desired by the Royal Society, as it would clear the field. The Committee was of the opinion that the different sciences require different treatment, subject to a general uniformity.

Dr. Adler stated that his resolution did not at all require that each science should have a different scheme of classification or registration. He maintained, however, that the arrangement should be from the point of view of the scientific man, and not of the classifier. If they could agree on a single uniform scheme so much the better.

Professor Klein supported this view, holding that it was important to pass on to the next matter relating to the appointment of committees for the study of the schedules.

Chevalier Descamps asserted that the resolution would result in more inconveniences than advantages. He stated that he and his colleagues of the International Office of Bibliography at Brussels were in a peculiar position. Without wishing to disparage the work done in any other country, he would say that they had collected two

million slips and that most of their work was proved by results which were here being ignored.

Dr. Adler reiterated it as his intention that as far as possible, a uniform system of registration be adopted. Chevalier Des-camps proposed adding words to this effect, asserting that classification was also a science with its own laws. From this Dr. Adler dissented, stating his view that classification and notation were simply convenient tools for sciences. The resolution was then unanimously agreed to, with the modifications proposed, reading as follows :

"That the registration symbols used in the Catalogue be based on a convenient combined system of letters, numbers or other symbols adapted, in the case of each branch of science, to its individual needs, and in accordance, as far as possible, with a general system of registration."

The second proposition of Dr. Adler was "That the authoritative decisions as to the schedules be intrusted to an International Committee, consisting of the following: Professor Darboux, Professor Klein, Professor Weiss, Dr. S. P. Langley, Professor Korteweg and Dr. Graf, together with three representatives of the Royal Society; that the Committee be instructed to consult with experts in each science and to frame within six months a report, which shall be issued by the Royal Society and incorporated in the decisions of the Conference."

Dr. Brunchorst agreed with the resolution in principle, but stated that the sciences were not equally represented.

Professor Darboux thought that the question raised by this resolution was a central one for the Conference. It was a pity that some practical step of this sort had not been taken at the previous Conference requesting the states to form a sort of embryo of Regional Committees which might have placed themselves in relation with the Royal Society.

Professor Korteweg pointed out that the resolution meant the nomination of a central commission to control, as far as possible, the different projects of classification. This commission need not contain representatives of all sciences, especially as it had the authority to secure the aid of special committees.

Professor Darboux thought it best that the official representatives at the Conference should constitute the local or regional committees of classification.

Dr. Bernoulli thought that the Conference had approached its second important question—that of organization. With regard to the first question—that of classification—he fully agreed with Dr. Darboux that it should be settled by the specialist in each branch of science for his own subject. The central committee proposed by the representative of the United States should have to do only with notation. Switzerland, he said, could not constitute a regional bureau or committee. But to a central committee of this sort he agreed, if it were made representative of the libraries as well as the sciences, and if the Director of the Bibliographical Institute at Brussels were included.

Professor Klein desired to bring the Conference back to the principal point as to how the classification of the schedules was to be made. It had been the intention to hold a conference of scientific men in Berlin for the purpose of arriving at some opinion, but this had been delayed, though the idea was not given up, and the plan of arriving at opinions, at least so far as Germany was concerned, seemed quite feasible to him.

Professor Weiss thought the resolution of the delegate from America quite agreed with Professor Klein's idea. Professor Rücker supported a resolution of this nature. He thought that the next scheme published should have some international weight.

Chevalier Descamps agreed in the main with the plan, though he remarked, in passing, that Belgium was not represented on the Committee. Professor Darboux and Dr. Graf discussed the best method of arriving at the opinions of the scientific men in the various countries. Dr. Mond thought the delegates from the various countries were the best medium for establishing the Committees; otherwise he favored the appointing of an International Committee as the best means of arriving at a definite conclusion—a view which was supported by Professor Klein.

M. Mascart requested permission to present the following resolution: "The Conference is of the opinion that the delegates be requested to take steps in their respective countries to organize local commissions charged to represent the Royal Society in the various countries; to study all questions relative to the International Catalogue of Scientific Literature, and to send a report to the International Committee."

Professor Foster favored the resolution introduced by Dr. Adler. The Royal Society had done its best, and the matter should now be left to a broader court, this latter body to be an authoritative one empowered to make final decisions. He did not regard this commission as representing different countries, but simply as composed of men chosen by this Conference.

Dr. Bernoulli suggested that the schedules be submitted to the various International Congresses, such as the Mathematical, Zoological and Chemical, etc.

Professor Foster replied that the Congresses of Zoology and Physiology met only once in three years. The matter had been brought to the attention of the Congress of Physiology, but not seriously discussed. He thought a Congress the worst body possible to which to submit the questions.

M. Mascart stated that after hearing the discussion he desired to modify his amend-

ment in the following manner: "The Conference holds the view that the delegates be requested to take steps through the governments of their respective countries to organize local commissions charged with studying all the questions relative to the cataloguing of scientific literature of the Royal Society, and to send a report in six months to an International Committee constituted under the patronage of the Royal Society. The International Committee shall examine all the solutions sent and reach a definite decision."

Professor Klein agreed with the proposition, pointing out, however, that the time allowed was too short, and declaring that any connection with International Scientific Congresses was impracticable, as they had no permanent organization. The debate continued for some time, and finally the first portion of Dr. Adler's motion, modified by Professor Klein, "That the authoritative decisions as to the schedules be intrusted to an International Committee to be hereafter named by the Conference, together with three representatives of the Royal Society," was unanimously agreed to. The resolution of M. Mascart concerning the appointment of local committees to report in six months was next adopted, and a further resolution that the International Committee frame its report not later than July 31, 1899.

Professor Boltzmann brought up the subject of some additional classes to be added to the list of sciences, more especially a class of general science. Professor Foster objected to having the subject reopened, and after a lengthy discussion the President ruled the discussion out of order; which, it may be said, was the single case of such a ruling at the Conference.

President Foster next raised the question of the functions of the regional bureaus. Dr. Graf stated the difficulties which were in the way of the organization of a regional

bureau in Switzerland, and thought it best that all the work be done by a central bureau. Professor Rücker pointed out that it would probably be easier for the various countries to find the money to pay for work done within their own borders. He also thought that in time authors could be got to prepare their own analyses. Dr. Bernoulli agreed with the opinion of his colleague. Dr. Graf and M. Otlet also supported the idea of a single central bureau. Professor Darboux, however, warmly upheld the decision reached at the first Conference, of having a central bureau and regional bureaus. All the resolutions relating to this subject as well as to the business conduct of the bureau were finally adopted, or referred to the International Council. They are given in the *Acta* and need not be referred to here.

The next matter of importance was with regard to the persons who should form the International Committee.

This was discussed at length, informally (the discussion not being reported), and it was finally agreed that the members be Professor Armstrong, Chevalier Descamps, Professor M. Foster, Dr. S. P. Langley, Professor Poincaré, Professor Rücker, Professor Waldeyer and Professor Weiss, with the understanding that the Committee may appoint substitutes, should any member be unable to serve, and that it have the privilege of adding two members.

M. Mascart then called attention to the desirability of the passage of a resolution which would give the Central Bureau the power of modifying decisions of the Conference, should they be found impracticable; and this, after discussion, was agreed to. There were some further remarks about the arrangement of the various sciences, which resulted in no formal action, it being held that the International Committee was competent to deal with these matters.

The final sitting of the Conference was

devoted to the consideration of the finances of the Catalogue.

Professor Rücker, on behalf of the Royal Society, stated that, while they had not gone into the matter in great detail, they were of the opinion that their estimates were approximately correct. The cost of producing the Book Catalogue was, in round numbers, £5,600. The least remunerative number of complete subscribers would be 350, taking the average of the complete subscription of £16. For the Primary Slip Catalogue a further £3,000 per annum would be necessary, which would be met by 130 complete subscriptions. This estimate is based upon the use of the linotype system. The Secondary Slip Catalogue would cost, in round numbers, £6,000 per year. If the scheme were carried out on this scale it would be possible to supply 133 cards for a franc, or 160 cards for a shilling. It was the hope of the committee that the Catalogue would ultimately pay its own way, though some plan must be found for guaranteeing its success. One way would be to receive direct subscriptions from foreign countries, as is done in the case of other international bureaus, or a guarantee fund might be established. The minimum period of experiment for the Catalogue would be fixed at five years, and should the entire scheme for books and cards be entered upon, a sum like £40,000 would have to be guaranteed to make sure of the success of the plan for the period of five years. This would be met if, say, ten of the great powers each take one share, the smaller powers two between them and the English colonies one amongst them; each share would then amount to £4,000 in the course of five years.

The delegates of the various countries were then requested to state what their countries might be expected to do.

Professor Klein, for Germany, stated that he was in no wise authorized to enter into

any engagements; he said, however, that at a recent conference of German scientific men it had been decided to recommend to the German government a subvention of 12,000 Marks per annum for the regional bureau; he was also prepared to recommend a subvention of £1,000 for the central bureau.

Professor Weiss stated that the Austrian government had agreed to provide fully for the expense of a regional bureau. The Vienna Academy was prepared to recommend a subvention of £200.

Doctor Heller said, in the name of the Hungarian government, that he had been authorized to state that the regional bureau for Hungary would be completely provided for at the expense of the Hungarian Academy of Science. He was not prepared to make any statement with regard to the guarantee fund.

Professor Darboux stated for France that his country would undertake the organization of a regional bureau, but with regard to a subvention he thought it difficult to obtain it outright; it might be much more feasible to accomplish the same result by guaranteeing a subscription to a certain number of copies of the Catalogue. Professor Rücker stated that such an arrangement with regard to subscriptions would be equivalent to a guarantee and would be satisfactory.

Doctor Adler stated, on behalf of the United States, that he was not authorized to make any agreement in regard to expenses; that in accordance with the recommendation of Dr. Billings and Professor Newcomb, delegates to the previous Conference, the Secretary of State had asked an appropriation of £2,000 per annum for the establishment of a regional bureau. He did not think that in any event the United States government could be brought to contribute to a guarantee fund, and if this were necessary it could be done more

readily through universities and scientific societies, and that the most feasible plan for the United States was that suggested by Professor Darboux, a given number of subscriptions to the Catalogue.

Dr. Graf, speaking for Switzerland, stated that he was prepared to make no promises, but that the plan suggested by Professor Darboux, to have his government subscribe for a given number of copies of the Catalogue, would be the one most easily carried out in his country.

Chevalier Descamps stated that he had no instructions from his government, but thought that the proposition made by Professor Darboux, that is, a subscription of a given number of copies, was one that Belgium would be most likely to carry out.

No definite statements were made on behalf of Norway, Sweden and Japan, the delegates being without instructions.

Sir John Gorst, speaking for Great Britain, stated that he too was without authority to pledge his government, but thought that the British government would be more likely to subscribe for a number of copies of the Catalogue than to give a guarantee.

It was suggested by Professor Foster that the delegates be requested to obtain information at an early date as to what assistance might be expected from their respective countries towards the expenses of the central bureau.

M. Mascart thought that the plan was still too indetermined to make the question of expense sufficiently definite. Professor Klein also seemed to think this somewhat premature; that the whole matter depended as to whether the scheme for the Catalogue could be brought into such form that one might say: "This is good, and we agree that it should be done in this way."

Dr. Graf desired that the Provisional International Committee should take the opportunity of examining the bibliographical

work now in actual operation in Switzerland, mentioning that of Dr. Field.

It was agreed further that the time of calling the Provisional International Committee together be left to the Royal Society.

Some discussion arose at this point with regard to the meaning of Article 22, as to whether the delegates continue to exist as delegates after the adjournment of the Conference. There was a joint agreement that the committees should be appointed by the delegates, and the report of these committees transmitted by the delegates.

After a vote of thanks to the Society of Antiquaries, and to the President, Sir John Gorst, the Conference adjourned.

It would seem ungracious not to mention the very pleasant hospitalities of the Royal Society, which gave a dinner to the delegates, presided over by its distinguished President, Lord Lister, and of the English delegates, who also gave a dinner, presided over by Sir Norman Lockyer.

The delegates had frequent meetings outside of the regular meetings of the Conference, which fact expedited the work. There was no division or national lines, all the conclusions being reached either as a result of the individual opinions of those present or based upon conditions existing in the country of the particular delegate.

The official Acta of the Congress were printed in the issue of SCIENCE for November 11, 1898.

On returning from abroad I submitted the accompanying report to the Secretary of State:

WASHINGTON, November 15, 1898.

SIR :

Having been appointed, together with Mr. S. P. Langley, Secretary of the Smithsonian Institution, a delegate on the part of the United States to the Conference on an International Catalogue of Scientific Literature, to be held at London on July 12, 1898, we proceeded abroad on July 2nd.

The British Government found it expedient to postpone the conference until October 11. At the re-

quest of the Department, and with the consent of the Secretary of the Smithsonian Institution, I continued abroad and attended the Conference. Mr. Langley's official duties necessitated his return to the United States in September.

The deliberations were in continuation of those had at a previous Conference in 1896, at which this Government was also represented. Satisfactory conclusions were reached, leaving only such questions as can be definitely determined by an International Committee, on which the United States is represented by Mr. Langley.

I have the honor to transmit herewith the Acta of the Conference. The *procès verbal* will be issued later, and a copy forwarded to the Department.

I beg most respectfully to bring to your notice the report of the delegates of the United States to the first Conference (Professor Simon Newcomb and Doctor J. S. Billings) to repeat the recommendations made by them, and to further draw your attention to the recommendation of the Secretary of the Smithsonian Institution, all of which is contained in Senate Document No. 43, 54th Congress, 2nd session, a copy of which is herewith appended.

I have much pleasure in informing you that both in public and privately, the Delegates of the United Kingdom, and of other Powers, expressed a very generous appreciation of the scientific activity of the United States, and I beg to be allowed to commend to the favorable consideration of the Department, the recommendation of such legislation as will enable the United States to worthily take its share in this highly important International project.

I have the honor to be

Sir, Your most obedient servant,

(Signed) CYRUS ADLER.

THE HONORABLE,

THE SECRETARY OF STATE.

His reply is given herewith :

L/S DEPARTMENT OF STATE,

Washington, November 25, 1898.

PROFESSOR CYRUS ADLER,

Smithsonian Institution, Washington, D. C.

SIR : I have to acknowledge the receipt of your letter of the 15th instant in regard to the work of the Conference on an International Catalogue of Scientific Literature which met at London on the 11th ultimo and to which you were a delegate on the part of the United States.

With reference to your suggestion that such legislation be recommended to Congress as will enable the United States to worthily take its share in this highly useful and important international project, I have to state that I had already in the estimates for this De-

partment for the fiscal year ending June 30, 1900, submitted an item of \$10,000, or so much thereof as may be necessary, for the purpose of carrying out on the part of the United States the recommendation of the International Conference on a Catalogue of Scientific Literature, and for the expense of clerk hire and for the other expenses of the work of cataloguing the scientific publications of the United States, the same to be expended under the direction of the Secretary of the Smithsonian Institution, and pointed out that as the preparation of the catalogue is to begin on January 1, 1900, it would be necessary for appropriate action to be taken by Congress at its forthcoming session, if this Government is to participate therein.

In support of this recommendation, I enclosed as appendices a copy of the Congressional document to which you refer and a copy of your report on the Conference of 1896. The estimates are now in print and it is too late to have your present letter included therein; but I shall, upon the assembling of Congress, communicate it to that body in further support of the item.

I am Sir,
Your obedient servant,
(Signed) JOHN HAY.

The following additional communication from the Department has also been received:

T/W DEPARTMENT OF STATE,
Washington, December 16, 1898.

DR. CYRUS ADLER,
Delegate of the United States to the Second International Conference on a Catalogue of Scientific Literature, Smithsonian Institution.

SIR: I enclose for your information copy of a note from the British Ambassador at this capital, conveying to this Government an expression of the grateful appreciation of the President and Council of the Royal Society for the cordial coöperation of the American Delegate in the arduous and difficult work of the recent Conference on a Catalogue of Scientific Literature.

I am Sir,
Your obedient servant,
(Signed) DAVID J. HILL,
Assistant Secretary.

Enclosure:

From British Ambassador, December 12, 1898, with enclosures.

Washington, December 12, 1898.

THE HON. JOHN HAY,
Secretary of State.

SIR: With reference to my note of July 12th respecting the International Conference in furtherance

of the project of an International Catalogue of Scientific Literature I am instructed by Her Majesty's principal Secretary of State for Foreign Affairs to convey to the United States Government the grateful appreciation of the President and Council of the Royal Society for the cordial coöperation of the United States Delegate in the arduous and difficult work of the Conference.

I am also instructed to furnish you with four copies of the Act of the Conference, two for the use of the United States Government, and two for that of their Delegate.

I have the honor to be
with the highest consideration

Sir:
Your obedient servant,
(Signed) JULIAN PAUNCEFOTE.

The House of Representatives took no action in pursuance of the request of the Secretary of State, but the following amendment to the Diplomatic and Consular Bill was reported to the Senate and passed by that body.

INTERNATIONAL CONFERENCE ON A CATALOGUE OF SCIENTIFIC LITERATURE.

For the purpose of carrying out on the part of the United States the recommendation of the International Conference on a Catalogue of Scientific Literature, held in London in July, 1896, for the expense of clerk hire and other expenses incident to the work of cataloguing the scientific publications of the United States, the same to be expended under the direction of the Secretary of the Smithsonian Institution, five thousand dollars.

The Amendment was, however, disagreed to in Conference and lost.

The following petitions in behalf of the proposition were presented to the Senate:

THE PUBLIC LIBRARY OF THE CITY OF BOSTON,
Boston, Mass., January 25, 1899.

HON. GARRETT A. HOBART,
Vice-President of the United States, President of the Senate.

SIR: The trustees of the Public Library of the City of Boston understand that Congress is to be asked for an appropriation to be placed at the disposal of the Smithsonian Institution to enable that institution to render necessary service in connection with the Royal Society index of scientific publications.

The trustees beg to urge upon you the importance of this undertaking. Although it carries the name of

the Royal Society, it is in fact international ; it has been organized by representatives from the various civilized countries ; its benefits will be shared by all civilized countries, and the index itself will be the product of contributions from them. The contribution asked for is not a direct gift of money, but a special service. For this country the proper agency for such service is at present the Smithsonian Institution. This institution cannot undertake it with its ordinary funds, and requires for it a special appropriation.

The amount of this is small compared with the importance of the service to be rendered.

Full information as to the details of the undertaking and of the particular work for which the appropriation would be expended will no doubt be laid before Congress.

The trustees of this library content themselves with calling to your attention the significance of the undertaking itself, and desire to express their conviction that the benefits which will result to libraries and other learned institutions and to individual scholars throughout the United States will be a most ample return for the expenditure proposed.

Very respectfully,

THE TRUSTEES OF THE PUBLIC LIBRARY OF THE
CITY OF BOSTON :

FREDERICK O. PRINCE, *President*,
SOLOMON LINCOLN, *Vice-President*,
JOSIAH H. BENTON, JR.,
HENRY P. BOWDITCH,
JAMES DE NORMANDIE.

By order of the board.

Attest :

HERBERT PUTNAM, *Clerk*.

Mr. Platt, of New York, presented the following resolution of the Board of Trustees of the New York Public Library, Astor, Lenox and Tilden Foundations :

" WHEREAS, The honorable Secretary of State has recommended to Congress the appropriation of the sum of \$10,000, to be expended under the direction of the Smithsonian Institution, for cataloguing the current scientific literature of the United States, to form a part of an International Catalogue of Scientific Literature : and

" WHEREAS, Each of the great European nations has undertaken to catalogue in like manner its own scientific literature for the same purpose, the whole to be edited and published by a central bureau : Therefore,

" *Resolved*, That the trustees of the New York Public Library, Astor, Lenox and Tilden Foundations,

respectfully urge upon Congress the great desirability of making the appropriation requested by the honorable Secretary of State for this purpose, as the work to be done is international in character and will be for the benefit of all scientific men and of all libraries and institutions of learning in the United States."

The motion was agreed to.

Petitions were also presented by the American Library Association and the John Crerar Library of Chicago, and a strong endorsement of the project was sent to the Committee on Appropriations by the Secretary of State.

For the purpose of obtaining the advice of scientific men and persons interested, in accordance with Resolution 22 of the Conference, the following Committee was named on the part of the United States : Dr. J. S. Billings, Chairman ; Professor Simon Newcomb, Dr. Theo. N. Gill, Professor H. P. Bowditch, Dr. Robert Fletcher, Mr. Clement W. Andrews, Mr. Herbert Putnam and Dr. Cyrus Adler. This Committee requested that Harvard University, Yale University, Columbia University, the University of Pennsylvania, Princeton University, Johns Hopkins University, the University of Michigan, the University of Chicago, Leland Stanford Junior University, the American Museum of Natural History, the Academy of Natural Sciences, the American Philosophical Society, the Library of Congress, the United States Coast and Geodetic Survey, the United States Geological Survey and the United States Weather Bureau appoint committees on the subject, these committees to report to the Committee above named by April 15th.

The request was generally acceded to, and with a few exceptions reports have been received which represent the opinions of a large number of scientific men and librarians in this country.

All of these reports and various informal suggestions were considered, and a series of resolutions, together with the reports, have

been transmitted to the Secretaries of the Royal Society, with an occasional expression of opinion as to the merits of the views presented in the several reports.

The next step will be the consideration of these reports and of similar reports from other countries and the formulation of a definite plan by the Provisional International Committee.

In view of the failure of Congress to make an appropriation for carrying on the work in this country, it will be necessary should the Catalogue begin January 1, 1900, to make some special provision. It is hoped that, by the cooperation of universities and libraries in five or six of the large centers, the work can be carried on for one year, and that when the subject is next presented to Congress it will meet with more favorable consideration.

CYRUS ADLER.

SMITHSONIAN INSTITUTION.

A DOUBLE INSTRUMENT AND A DOUBLE METHOD FOR THE MEASUREMENT OF SOUND.

THE work briefly sketched here, at the request of the editor of *SCIENCE*, was done by the writer in the laboratory of Clark University, and grew out of the suggestion of Professor Webster, that the optical arrangement of Michelson's refractometer, combined with an accoustical method employed by Wien,* might yield a sound-measuring apparatus of great sensitiveness.

RECEIVER.

For this purpose one totally reflecting mirror of the refractometer was made very small and light, and was mounted upon a thin glass plate, which formed a portion of the walls of a spherical, Helmholtz resonator. A pure tone of the same pitch as the resonator causes the interference bands to vibrate with the same frequency. In order to render the maximum displacement

visible, the fringes were made vertical, then cut down to a narrow band by a screen with a horizontal slit. This band was viewed by means of a telescope whose object glass was a small lens mounted upon the end of a tuning fork of the same frequency as the source of sound. The fork was driven electrically and the motion of the lens was perpendicular to the narrow band, so that, if the sensitive resonator plate were protected from all sound, the fringes would not be displaced, but the motion of the object glass would stretch out the narrow band into a broad band of vertical fringes. If now a tone were admitted to the resonator the fringes would be simultaneously displaced. In case of the identical agreement of both frequency and phase of the telescope fork with the forced vibration of the resonator plate (excited by the source of sound) the composition of motions would result in a similar band, but one covered with oblique fringes whose slope is a function of the intensity of the sound. Identity of phase is easily realized by making the telescope fork actuate the source of sound; but identity of phase depends upon the distance of the source of sound (as well as upon some elements involved in the mechanical construction of the source of sound, which elements cannot be varied within limits sufficiently wide to compensate for all phase differences depending on various distances of the source), and consequently this identity could be obtained only at particular settings. In a room filled with standing waves from the source, these settings can be found by moving in the three dimensions either the source of sound or receiver. But this adjustment is laborious, and this limitation renders the apparatus unsuited to general investigation. Without such adjustment the composition of the motions of the bright spots in the narrow band gives a set of overlapping ellipses, obscuring the displacement.

* Wied. Ann., 1889, p. 835.